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A.I.A. File No. 4-K-2

KAYLO®
Insulating
ROOF TILE

For Lightweight, Non-Combustible Roof Decks

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A.I.A. File No. 4-K-2

? PHILA. BLDG. Code Approval Date

KAYLO DIVISION
OWENS-ILLINOIS GLASS COMPANY
TOLEDO 1, OHIO

BS LINFOOT

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Kaylo Roof Tiles have a rare combination of strength and light weight. Tiles are easy to handle, easy to carry. Moving loads of tiles across Kaylo Roof Decks in wheelbarrows or dollies is common practice.

KAYLO®
Insulating
ROOF TILE

SETS A NEW STANDARD FOR LIGHTWEIGHT NON-COMBUSTIBLE ROOF CONSTRUCTION

Kaylo Insulating Roof Tile laid on light steel members now makes available for the first time a roof deck in which fire protection, structural strength and insulation are all provided in a single lightweight all-mineral unit.

• LIGHTWEIGHT •

Kaylo Roof Tile decks weigh approximately six pounds per square foot, including supporting sub-purlins, or around five pounds to the square foot for the roof tile only.

Thus it is now possible to design a deck made with a non-combustible tile so that the dead load above the main purlins, including an excellent built-up roofing, is about twelve pounds per square foot of roof area.

• STRUCTURAL UNIT •

Kaylo Roof Tile is not merely a roof insulation. It is a reinforced structural unit designed for a total load of fifty pounds per square foot with an adequate safety factor. Its flexural strength is more than sufficient for typical roof deck requirements.

• INSULATES AS IT COVERS •

This lightweight roof deck combines structural strength and thermal insulation in one material. Since Kaylo Insulating Roof Tile provides insulation value equal to that of an inch and one-half of standard insulating board, no additional insulation is needed for usual installations. A special operation of applying insulation over the structural deck is thus eliminated.

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KAYLO ROOF TILE

FIREPROOF

Kaylo Roof Tile provides a new standard of fire protection for lightweight construction. The tile themselves will withstand building fire temperatures as defined by the standard A.S.T.M. fire curve, for more than one hour without failing in load-carrying capacity and without permitting a temperature rise on the cold side great enough to constitute failure. Fire originating above a Kaylo roof deck is prevented from producing dangerous temperatures within the building for a period of at least one hour.

Because of economy of steel in the supporting structure made possible by a Kaylo roof deck; because of its incombustibility; because of its insulation value; because of its live-load-carrying capacity in relation to the dead load of the deck; and because it can be erected rapidly; this roof construction recommends itself to every architect and engineer who has a major roof construction problem today.

FIELD TESTED

Kaylo Insulating Roof Tile was introduced to the public in 1948 after several years of experimental development and pilot plant manufacture by the Owens-Illinois Glass Company. Since that time its record for gaining market acceptance has been outstanding. Millions of square feet of Kaylo Roof Tile are in service throughout the United States and in foreign countries.

GENERAL DESCRIPTION

Kaylo Insulating Roof Tile is white, or whitish in appearance and is made entirely of an incombustible mineral base which is predominantly a hydrous calcium silicate into which mineral fibers have been incorporated. Each tile is reinforced by a welded wire mesh placed in it during manufacture.

The unique cellular structure of Kaylo Insulating Roof Tile makes possible its remarkable combination of desirable characteristics. Kaylo Insulating Roof Tile has cells so small they are measured in fractions of a micron, and so tremendous in number that more than 80% of the tile is composed of air cells which together have a total wall area of more than one hundred acres per cubic foot of tile!

Tile units have smooth surfaces with a light reflection factor of approximately 80 per cent. The underside of the roof deck often serves as a ceiling, eliminating the need for additional finishing.

SAVES ERECTION COSTS

Kaylo insulating roof decks are easier to install than ordinary decks. Workmen like Kaylo Roof Tile.

Kaylo Insulating Roof Tile may be laid on Owens-Illinois Glass Company sub-purlins or other structural members, metal or wood. Then the deck is ready for covering by conventional roofing materials.

No added application of roof insulation is necessary except where special conditions require an unusually high degree of insulation.

Kaylo Insulating Roof Tile can be fitted to odd-sized spaces at the job-site without special tools. Any saw which will cut the wires, such as a light power saw, is suitable. Kaylo Roof Tile can be readily chipped or gouged to fit irregular surfaces.

Because of its light weight and convenient size, Kaylo Roof Tile is easy to carry to the place where it is to be laid. It has been designed as a simple, one-man tile.

VERSATILE

Kaylo Insulating Roof Tile is equally effective on flat or pitched roofs and is used on industrial, commercial and institutional buildings. It is also ideal for dormer or monitor walls.

SPECIFICATIONS, DESIGN DATA AND DE

Rail Sub-Purlin No. 101

NOTE: The general conditions of the contract are hereby made, by reference, a part of this specification.

SCOPE

This work consists of furnishing all labor and materials necessary for the installation of Kaylo Roof Tile, including steel sub-purlins, grout and curbs as shown on the drawings, or as specified herein, or both.

MATERIALS

1. Sub-purlins. Steel sub-purlins shall be Owens-Illinois Glass Company structural steel rail sections No. 101.

Sub-purlins shall have one shop coat of metal-protective paint.

2. Kaylo Roof Tile. Roof tile shall be precast and reinforced Kaylo Roof Tile, 2⅝ inches thick by 18 inches wide by 36 inches long, as made by Owens-Illinois Glass Company.

3. Anchors. Anchors are not required with Owens-Illinois Glass Company sub-purlins No. 101, unless noted on drawings.

4. Grout. Grout for end joints of tile shall be composed of the following materials, using either vermiculite or perlite aggregate.

VERMICULITE AGGREGATE GROUT
(for approximately 1,000 square feet of deck)

Gauging plaster, quick-set:	4—100-lb. bags
Vermiculite plaster aggregate:	1—4-cubic foot bag

PERLITE AGGREGATE GROUT
(for approximately 750 square feet of deck)

Gauging plaster, quick-set:	2—100-lb. bags
Perlite plaster aggregate:	1—4-cubic foot bag

Dry ingredients shall be added to water to provide consistency such that mixture can be poured, but not so thin that aggregate will float. Mixture shall be stirred thoroughly to remove all lumps. Dry materials may be mixed in large quantities as desired, but mixed with water only in small batches which can be used immediately.

Owens-Illinois premixed grout, ready for mixing with water, in 80-lb. bags to cover approximately 250 sq. ft., may be used.

5. Curbs. Kaylo Insulating Roof Tile, 2⅝ inches thick by 18 inches wide by 36 inches long, shall be used for curbs wherever shown on plans. Tiles shall be cut on job to height required.

6. Cants. Cant strips shall be Kaylo cant strips 1¾ inches thick by 7 inches long.

INSTALLATION

1. Sub-purlins. To receive Kaylo Roof Tile, No. 101 sub-purlins shall be accurately spaced 3 feet 1 inch on centers.

Sub-purlins shall be welded to each support with one fillet weld, ¾ inch long placed on alternate sides of sub-purlins. At ends of sub-purlins place welds on both sides. Where ends of sub-purlins bear on masonry, they shall be securely anchored to the masonry.

2. Kaylo Roof Tile. Kaylo Roof Tile shall be spaced evenly on sub-purlins to provide a minimum end bearing of ½ inch. Tile shall be butted tightly together at sides. Cut tile to fit at ridges, hips, valleys, parapets, curbs, walls, around vents, pipes, etc. and grout in place.

Where necessary to cut standard pieces for fitting, any hand or power saw which will cut the wire mesh is suitable.

3. Grout. Joints at ends of tile over sub-purlins, and at ridges and hips, shall be filled with grout mixed as specified. The stem of the sub-purlin shall be completely surrounded with grout to provide a key anchorage against uplift pressure.

Grout shall be poured into joints until the grout protrudes slightly above the surface of the tile. When grout has reached its initial set (few minutes), scrape joints flush with the tile surface. Sweep all loose and excess grout from the roof, leaving the roof deck free from all foreign matter.

4. Saddles. Where concrete (either lightweight or gravel aggregate) saddles or cants are used over Kaylo Roof Deck, prime surface of tiles which receive saddles, or cants, with asphalt primer. Mop primer over top surface of tile using not less than 7.5 pounds (one gallon) per one hundred square feet of roof.

DESIGN DATA FOR RAIL SUB-PURLIN NO. 101

ALLOWABLE SUB-PURLIN SPANS FOR VARIOUS LOADS
(Sub-Purlin Spacing—3'-1" O. C.)

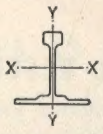
Live Load (Lbs. per sq. ft.)	Total Load (Lbs. per sq. ft.)	Max. Allowable Span (C. to C. of Support) f=20,000 p.s.i. WL/10	f=20,000 p.s.i. WL/8	f=18,000 p.s.i. WL/10	f=18,000 p.s.i. WL/8
20	32	9'-3"	8'-3"	8'-9"	7'-10"
30	42	8'-0"	7'-2"	7'-7"	6'-10"
40	52	7'-2"	6'-5"	6'10"	6'-1"
45	57	6'-10"	6'-2"	6'-6"	5'-10"

Note: Spans shown in table are for flat roofs. Where the sub-purlins run parallel to the ridges on steep roofs and unsymmetrical bending occurs, reduce span.

DEAD LOAD

Kaylo Roof Tile and sub-purlin— 6.0 lbs. per sq. ft.
Built-up roofing (tar and gravel)— 6.0 lbs. per sq. ft.
Total dead load 12.0 lbs. per sq. ft.

SECTION PROPERTIES

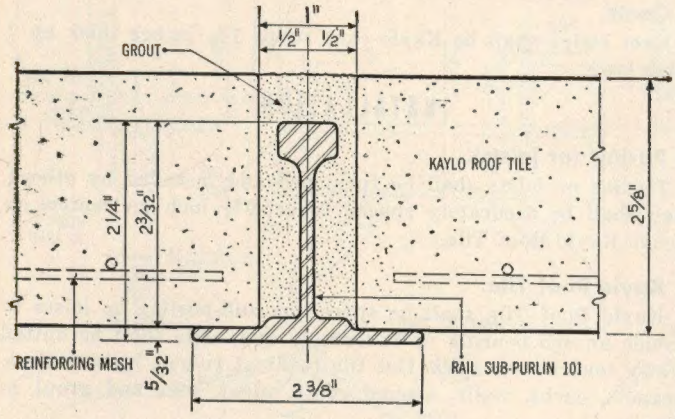


Size	Weight	Spacing	Ix-x	Iy-y	Sx-x
2¼" x 2⅜"	3.3 lb./l.f.	3' 1" o.c.	.67 in.^{4}	.182 in.^{4}	.50 in.^{3}

DESIGN FORMULAE

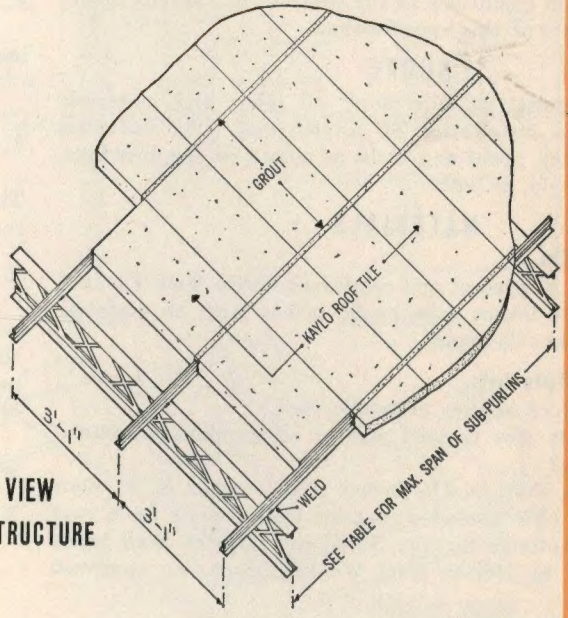
WL/8 — Use where sub-purlins span only a single purlin space.
WL/10 — Use where the sub-purlins will be three or more purlins spaces long.

TAILS . . . . . KAYLO ROOF TILE

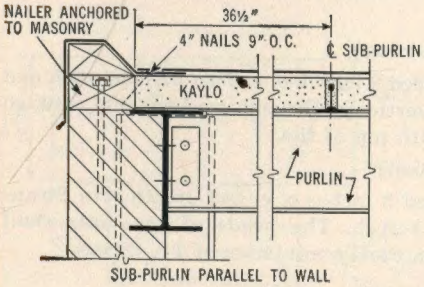


SECTION THROUGH JOINT

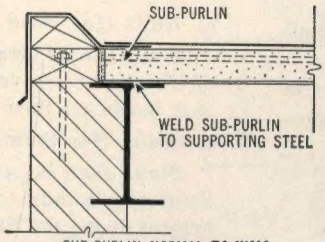
HALF SIZE



ISOMETRIC VIEW
OF ROOF STRUCTURE

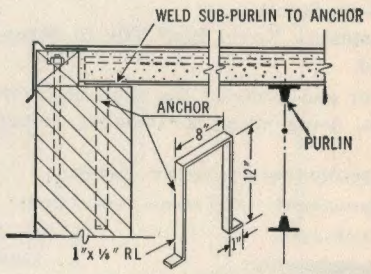


SUB-PURLIN PARALLEL TO WALL



SUB-PURLIN NORMAL TO WALL

EAVE SECTIONS — FLAT ROOF WITH CURB

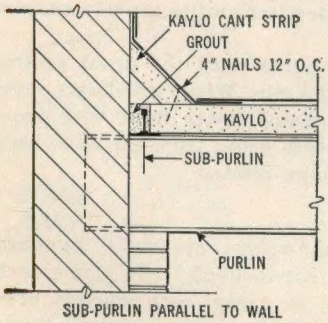


SUB-PURLIN WALL BEARING

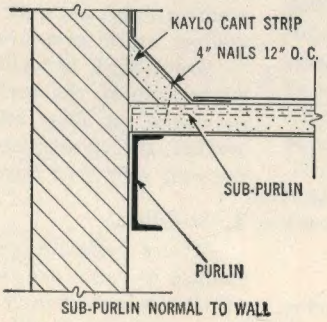
EAVE SECTION

RAIL SUB-PURLINS

Scale ¾" = 1'-0"
Except as noted

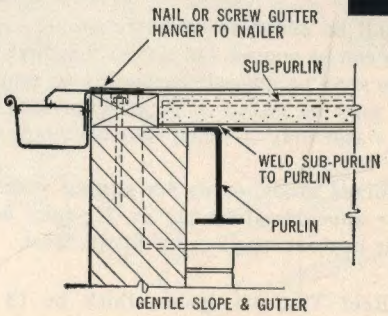


SUB-PURLIN PARALLEL TO WALL



SUB-PURLIN NORMAL TO WALL

FLAT ROOF WITH PARAPET



EAVE SECTION

SPECIFICATIONS, DESIGN DATA AND DE

Standard Structural Members

NOTE: The general conditions of the contract are hereby made, by reference, a part of this specification.

SCOPE

This work consists of furnishing all labor and materials necessary for the installation of Kaylo Roof Tile, including (bent studs) (nails), grout and curbs as shown on the drawings, or as specified herein, or both.

MATERIALS

1. Kaylo Roof Tile.

Roof tile shall be precast and reinforced Kaylo Roof Tile, 2⅝ inches thick by 18 inches wide by 36 inches long, as made by Owens-Illinois Glass Company.

2. Anchorage Materials.

(Select one which applies to details used.)

ab. Bent studs (for trussed purlins or standard structural shapes)

Bent studs shall be 1½ inches x 1½ inches N. T. Bent O.L.E. Studs. (Not threaded; outside loaded end.) Each stud shall have a suitable ferrule. Studs and ferrules shall be as manufactured by Nelson Stud Welding Corp., or approved equal.

c. Nails (for wood framing)

Nails for fastening Kaylo Roof Tile to wood framing members shall be 20d common x 4 inches long, hot-dip galvanized.

d. Nails (for Stran-Steel)

Nails for fastening Kaylo Roof Tile to Stran-Steel shall be 8d galvanized.

3. Grout. Grout for end joints of tile shall be composed of the following materials, using either vermiculite or perlite aggregate.

VERMICULITE AGGREGATE GROUT

(for approximately 1,000 square feet of deck)

Gauging plaster, quick-set:	4—100-lb. bags
Vermiculite plaster aggregate:	1—4-cubic foot bag

PERLITE AGGREGATE GROUT

(for approximately 750 square feet of deck)

Gauging plaster, quick-set:	2—100-lb. bags
Perlite plaster aggregate:	1—4-cubic foot bag

Dry ingredients shall be added to water to provide consistency such that mixture can be poured, but not so thin that aggregate will float. Mixture shall be stirred thoroughly to remove all lumps. Dry materials may be mixed in large quantities as desired, but mixed with water only in small batches which can be used immediately.

Owens-Illinois premixed grout, ready for mixing with water, in 80-lb. bags to cover approximately 250 sq. ft., may be used.

Note: Reduce water content when using Stran-Steel.

4. Curbs.

Kaylo Insulating Roof Tile, 2⅝ inches thick by 18 inches wide by 36 inches long, shall be used for curbs wherever shown on plans. Tiles shall be cut on job to height required.

5. Cants.

Cant strips shall be Kaylo cant strips 1¾ inches thick by 7 inches long.

INSTALLATION

1. Purlins (or joists).

Purlins or joists shall be furnished and installed by others. They shall be accurately spaced 3 feet-0½ inch on centers to receive Kaylo Roof Tile.

2. Kaylo Roof Tile.

Kaylo Roof Tile shall be spaced on sub-purlins or joists to provide an end bearing of at least ½ inch. Tile shall be butted tightly together at sides. Cut tile to fit at ridges, hips, valleys, parapets, curbs, walls, around vents, pipes, etc., and grout in place.

Where necessary to cut standard pieces, any hand or power saw which will cut the wire mesh is suitable.

3. Anchorage.

(Select one which applies to details used.)

ab. Bent studs (for trussed purlins or standard structural shapes)

Bent studs shall be securely welded to the top chord of purlins by the Nelson Stud Welder or other approved method. They shall be spaced 9 inches o. c. and lined up accurately on each purlin.

c. Nails (for wood framing)

Nails shauld be spaced 9 inches o. c. Two nails at each end of tile shall be driven vertically through roof tile and sunk so that heads are flush with top of tile.

d. Nails (for Stran-Steel)

Nails shall be spaced 3 inches o. c. and driven into Stran-Steel a minimum of 1 inch. The heads of the nails shall project above the Stran-Steel a minimum of 1½ inches.

4. Grout.

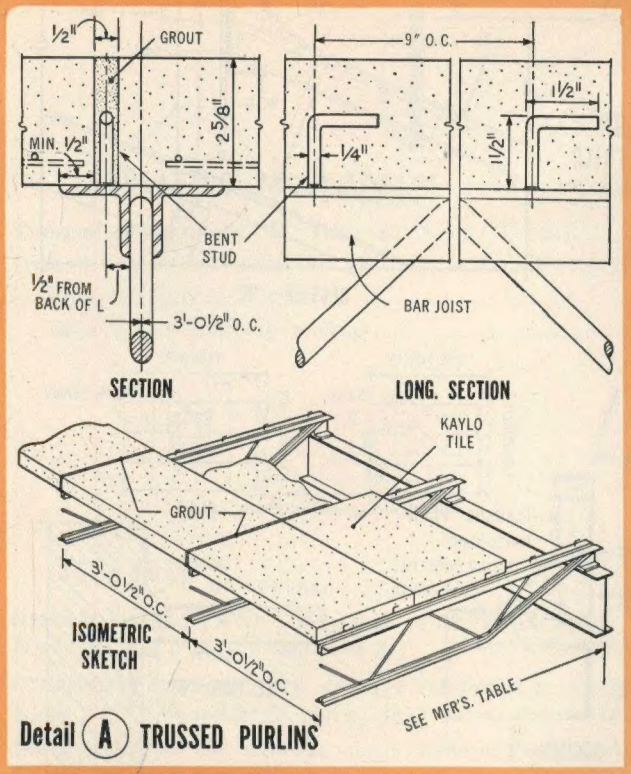
Joints at ends of tile over purlins or joists and at ridges and hips, shall be filled with grout mixed as specified. The grout shall completely fill the joint over the purlins so that the (bent studs) (nails) are entirely encased in grout to provide anchorage against uplift pressure.

Grout shall be poured into joints until the grout protrudes slightly above the surface of the tile. When grout has reached its initial set (few minutes), scrape joints flush with the tile surface. Sweep all loose and excess grout from the roof, leaving the roof deck free from all foreign matter.

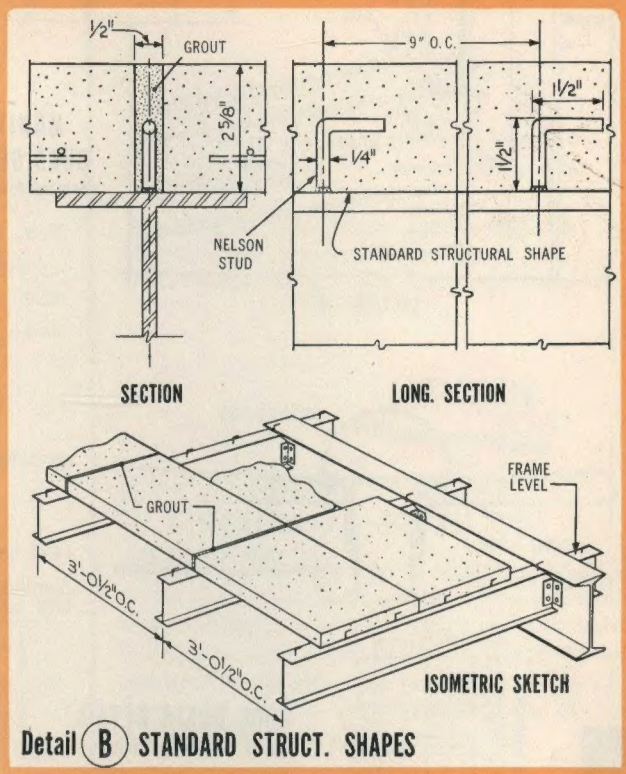
5. Saddles.

Where concrete (either lightweight or gravel aggregate) saddles or cants are used over Kaylo Roof Deck, prime surface of tiles which receive saddles, or cants, with asphalt primer. Mop primer over top surface of tile using not less than 7.5 pounds (one gallon) per hundred square feet of roof.

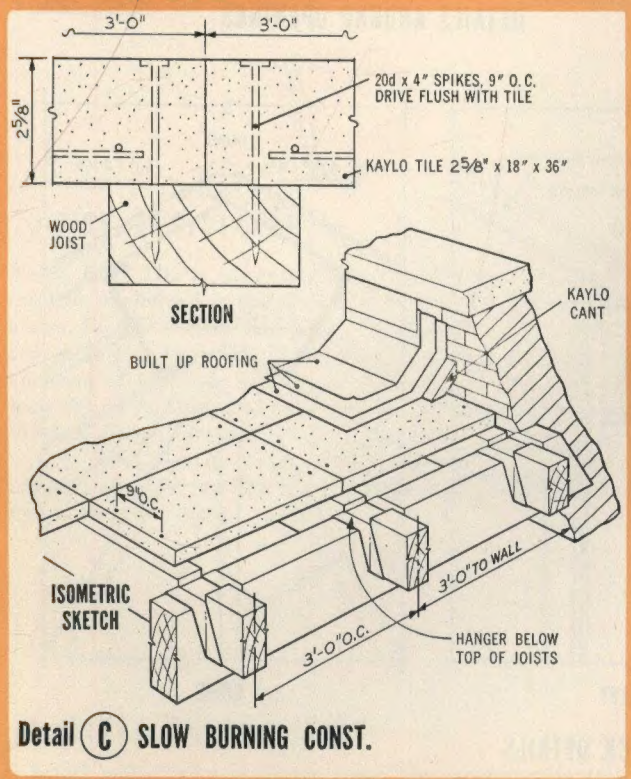
TAILS . . . . . KAYLO ROOF TILE



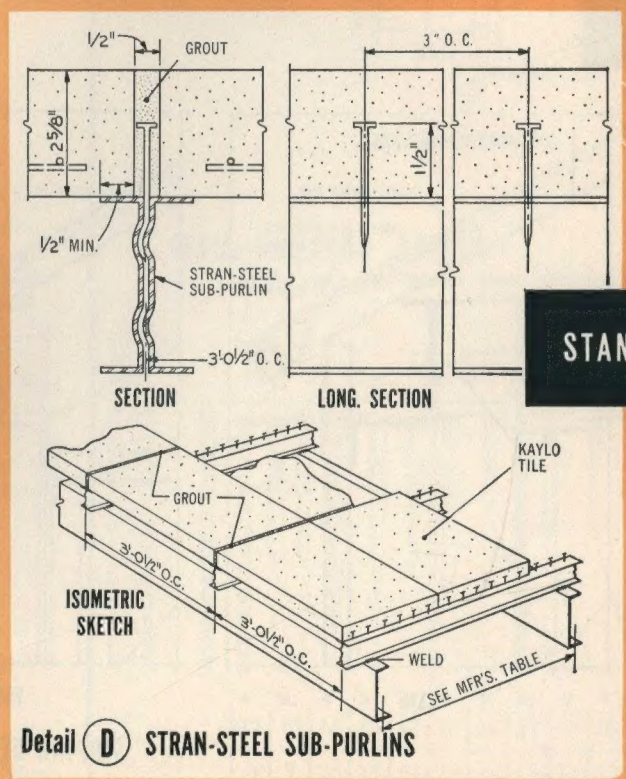
Detail (A) TRUSSED PURLINS



Detail (B) STANDARD STRUCT. SHAPES



Detail (C) SLOW BURNING CONST.

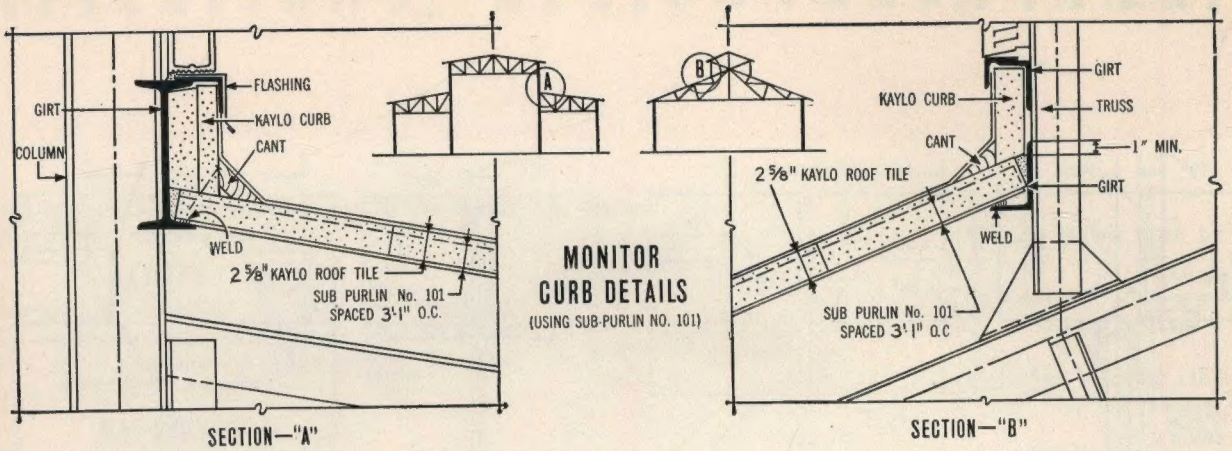


Detail (D) STRAN-STEEL SUB-PURLINS

STANDARD PURLINS

TYPICAL DETAILS

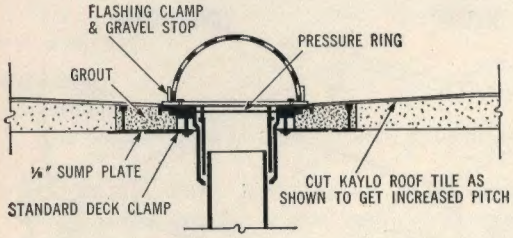
Scale 3/4" = 1'-0"
Except as noted

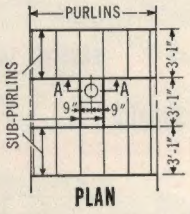


SECTION—"A"

MONITOR CURB DETAILS
(USING SUB-PURLIN NO. 101)

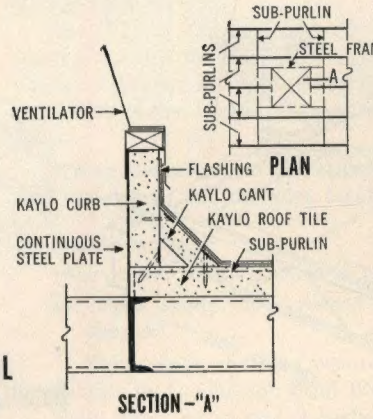
SECTION—"B"


FLASHING CLAMP & GRAVEL STOP
PRESSURE RING
GROUT
1/4" SUMP PLATE
STANDARD DECK CLAMP
CUT KAYLO ROOF TILE AS SHOWN TO GET INCREASED PITCH



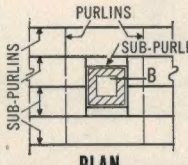
PLAN

ROOF DRAIN DETAIL
WITH SUB-PURLIN FRAMING

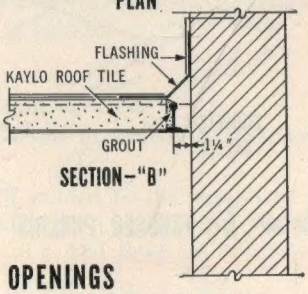


SECTION—"A"

PLAN

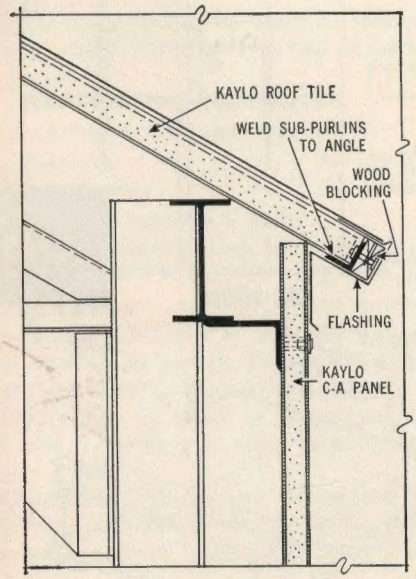


PLAN

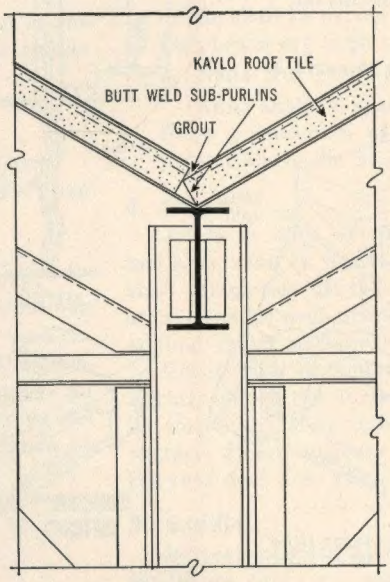


SECTION—"B"

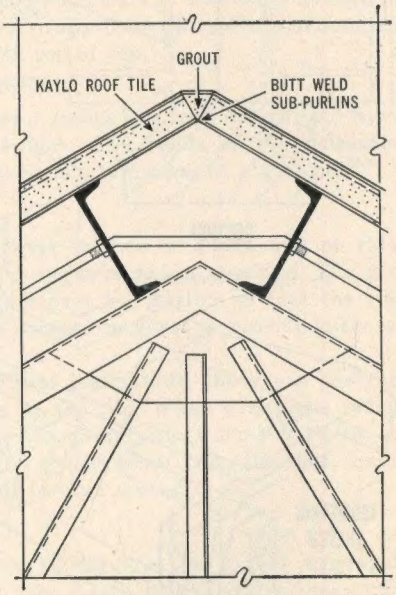
DETAILS AROUND OPENINGS



EAVE



VALLEY



RIDGE

SLOPING DECK DETAILS

TECHNICAL DATA KAYLO ROOF TILE

INSULATING VALUE

Thermal conductivity "K" (Btu./sq. ft./hr./°F./in.)	0.62
Overall heat transf. coef. "U" (Btu./sq. ft./hr./°F./thickness)	
Roof tile only	0.20
Roof tile + built-up roofing	0.19

STRENGTH

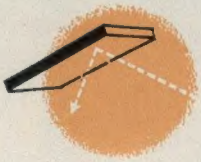
FLEXURAL STRENGTH. With a total load of 50 lbs. per sq. ft., Kaylo Roof Tile has a safety factor of 8.

COMPRESSIVE STRENGTH. The average compressive strength for Kaylo Roof Tile is 500 lb. per sq. in.

SHEAR STRENGTH. The average shear strength for Kaylo Roof Tile is 175 lb. per sq. in.

FIRE RESISTANCE

Kaylo Roof Tile is incombustible. It will resist a typical building fire, as defined in the standard A. S. T. M. time-temperature curve, for more than one hour. Thus, a fire originating on the top side can burn off the applied covering and the fire resistance of the tile will enable the tile to carry its required load for more than one hour and at the same time protect the interior from excessive temperature rise. For a fire originating within the building the limit of endurance is the limit of the supporting steel or the limit of the construction immediately below the roof deck.

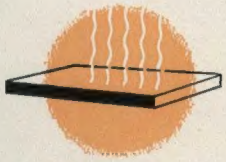


LIGHT REFLECTIVITY

Light reflectivity of Kaylo Roof Tile is approximately 80%.

WEIGHT

Approximate weight per square foot (lb.)	5.0
Approximate density (lb. per cu. ft.)	20.5
Approximate weight per tile (lb.)	23.0



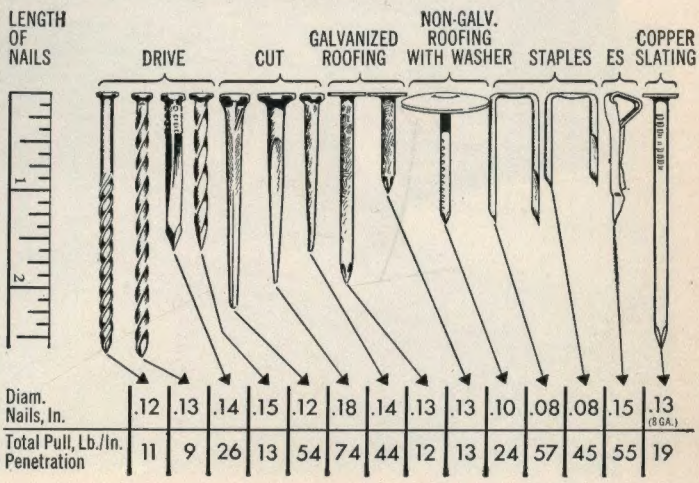
DIMENSIONAL STABILITY

DIMENSIONAL CHANGE DUE TO MOISTURE. The linear expansion of Kaylo Roof Tile after repeated cycles of soaking and drying is approximately .04 of 1%. This equals an increase in length for a standard tile of only fourteen-thousandths of an inch.

STRENGTH WHEN WET. The flexural strength of Kaylo Roof Tile when soaking wet (after soaking for 10 hours) is approximately 85% of its normal strength.

NAIL-HOLDING POWER

RESISTANCE TO DIRECT NAIL WITHDRAWAL



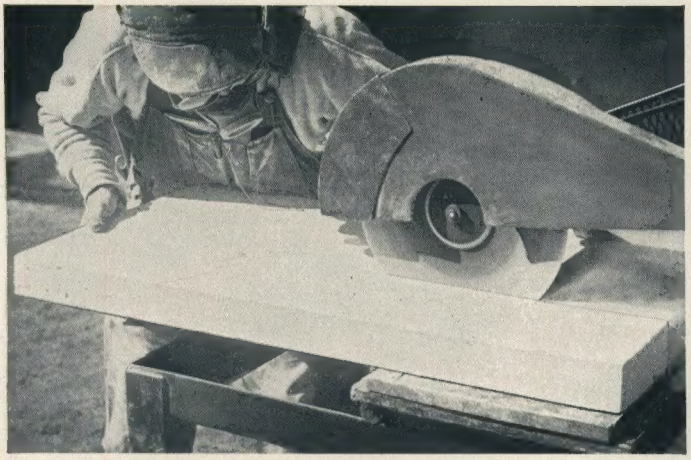
Diam. Nails, In.	.12	.13	.14	.15	.12	.18	.14	.13	.13	.10	.08	.08	.15	.13 (8GA.)
Total Pull, Lb./In. Penetration	11	9	26	13	54	74	44	12	13	24	57	45	55	19

Owens-Illinois Glass Company rail sub-purlin No. 101 is structurally economical, easy to install. Note flame cuts to accommodate purlins to change in roof pitch.

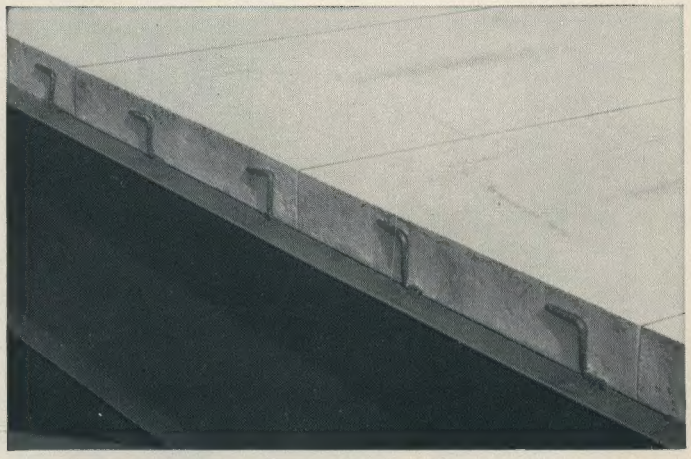
Kaylo Roof Tile is easily handled by one man. Tile can be distributed directly to point of application.

Unloaded direct from car and stacked, Kaylo Roof Tiles are ready for distribution to application centers.

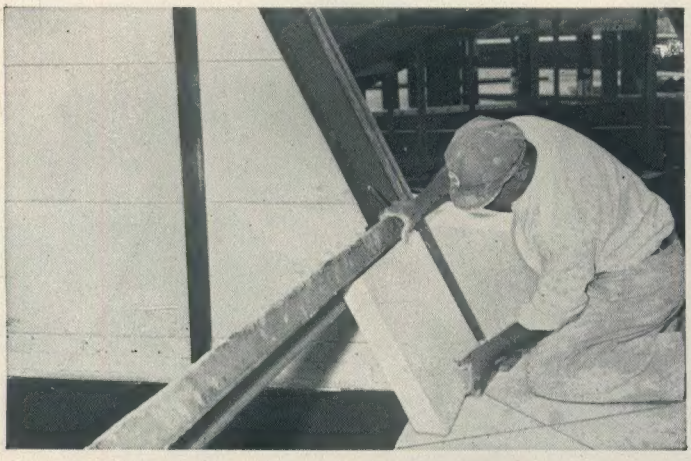
INSTALLATION KAYLO ROOF TILE



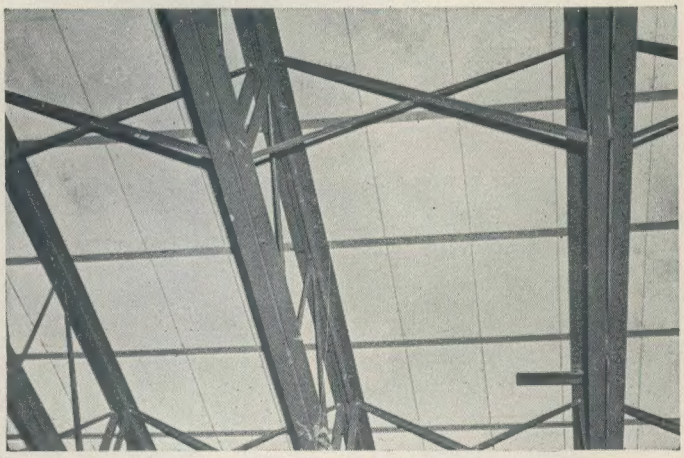
Cutting Kaylo Roof Tile to fit odd spaces is easily accomplished with power or handsaw. Tile can also be cut or gouged with a knife to fit over rivet heads.



Nelson Studs can be used to form anchors in spots where tiles are supported by structural members.



Fitting Kaylo Roof Tile to skylight. Cutting can be done with ordinary hand tools such as a hatchet.



Underside of Kaylo Roof Deck forms a completed ceiling, without treatment or painting. It reflects light, raises illumination levels, as shown above.

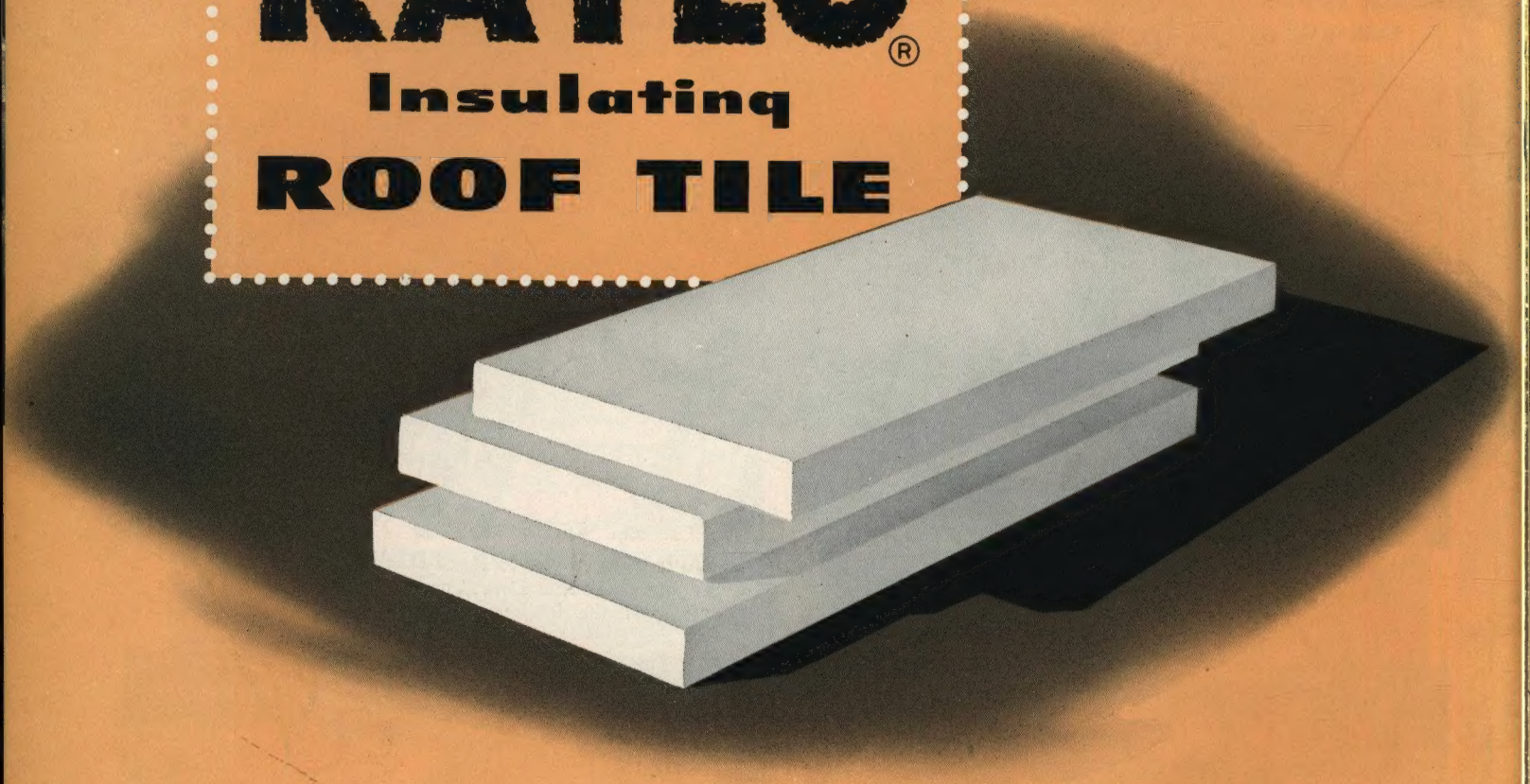
Welding rail sub-purlin No. 101. Note templates or jigs to space purlins accurately between centers.

Final Step is the simple task of applying standard built-up roofing. Erecting a Kaylo Roof Deck is remarkably easy, all the way.

KAYLO®

Insulating

ROOF TILE



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